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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST ECONOMICS

FOREST PRODUCTS

RANGE RESEARCH

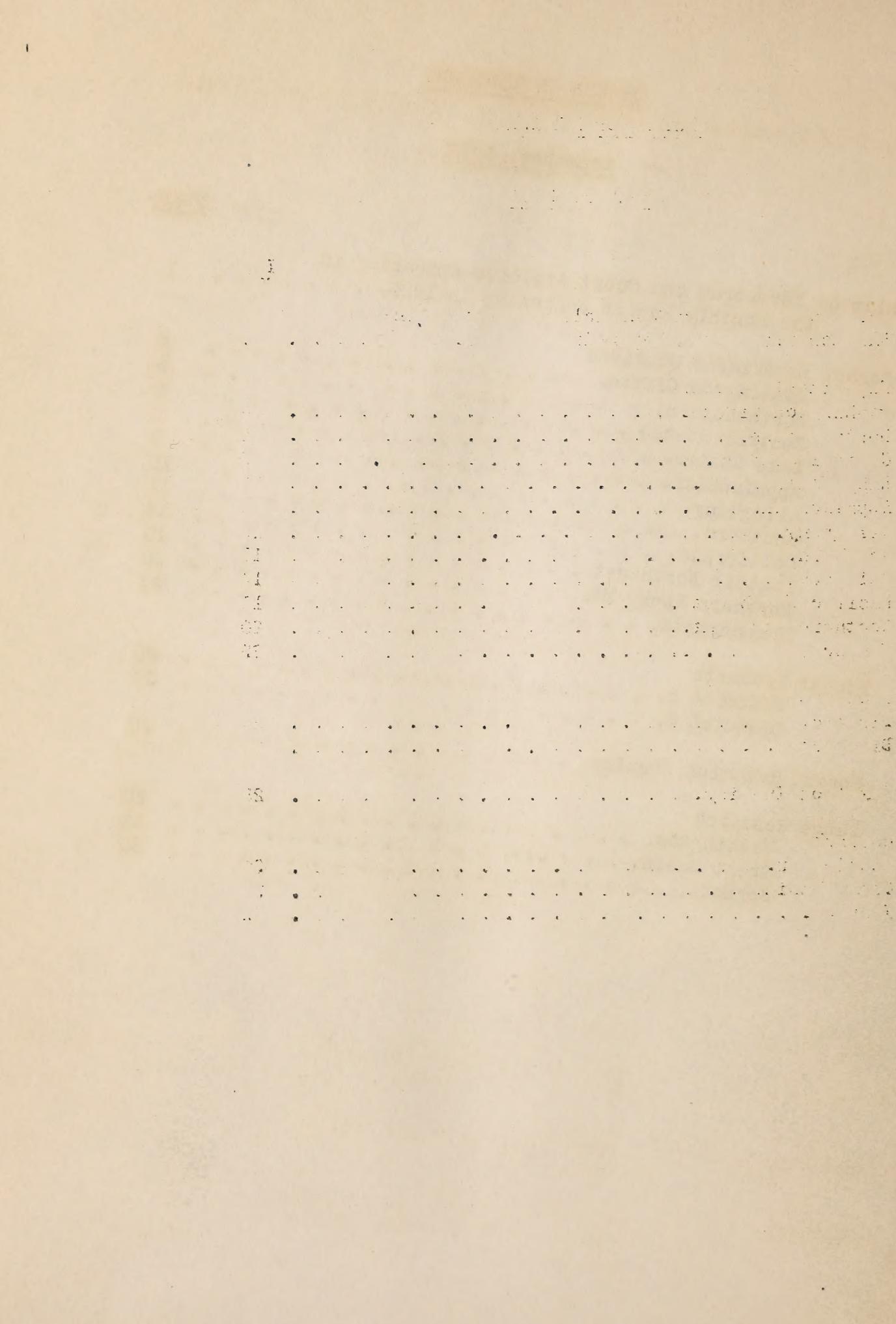
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BRANCH OF RESEARCH

December, 1928

	<u>Page</u>
List of Forewords and Short Articles appearing in the Monthly Report beginning in 1925.	1
Forest Experiment Stations	
Washington Office.	4
Northeastern.	5
Central States	6
Lake States.	7
Appalachian.	9
Allegheny.	10
Southern.	11
California.	14
Pacific Northwest	18
Northern Rocky Mt..	20
Manuscripts.	23
Forest Products	
District 1.	25
District 6.	28
Forest Taxation Inquiry.	28
Range Research	
Washington.	30
Great Basin.	32
Jornada.	33



List of Forewords and Short Articles Appearing in the Monthly
Report Beginning in 1925.

<u>Author</u>	<u>Title</u>	<u>Issue of Report</u>
<u>1925</u>		
Robinson, J. H.	From "Humanizing of Knowledge"	January
Youngblood, B.	The Research Spirit in Scientific Institutions	February
McCall, J. E.	Use of Bibliographies: From Experiments in Education	March
Allen, E. W.	Administration of Experiment Station Work by Projects	April & May
Williams, Henry S.	Research	June
Thatcher, R. W.	Station Organization and Policy	July
" " "	Preparation of a Program of Work	August
" " "	Advantages of a Program of Work	September
Watt, H. A.	The Composition of Technical Papers	November
Committee	A Code of Ethics for Experiment Station Workers (Report of Committee on Experiment Station Organization and Policy of Association of Land Grant Colleges)	December

1926

Bok, Edward	(From) "Twice Thirty"	January
Mees, C. E. K.	Staff of a Research Laboratory	Feb., March, and April
Wackerman, A. E.	A Convenient Test for Soil Reaction	May
Anonymous	An Editor's First Aid to Young Writers, From Literary Digest Book Review	June

(Over)

<u>Author</u>	<u>Title</u>	<u>Issue of Report</u>
Clapp, E. H.	What Monthly Reports Should Include	June
Stockbridge, H.E.	Your Library and Mine	June
Korstian, C. F.	Factors Controlling Germination and Early Survival in Oaks	July
Reid, E. E.	Introduction to Research	July, August and September
Dana, S. T.	The World's Forestry Congress	August
Bates, C. G.	Practical Demonstration of the Im- portance of Seed Selection	September
Munger, T. T.	Alchemists and Researchers	October
Crane, E. J.	Literature Searches	November
Bates, C.G.	A Practical Measure of Water Consumption	November
Reid, E. E.	Personnel - Breadth of Training	December

1927

Anonymous	What is Research?	January & February
Ball, Carleton R.	Some Obligations of the Scientist	March
Carmichael, R. D.	The Meaning of Graduate Study (President's address at Iowa Chapter of Society of Sigma XI, State Univ., Iowa City, Iowa. Feb. 17, 1926)	April & May
Ball, C. R.	The Technical Bulletin as a Writer Sees It.	June and July
Doten, S. B.	Higher Standing for Institutions of Scientific Research.	August
Howard, Albert	The Ideal Investigator (From "Crop- production in India, 1924")	October

<u>Author</u>	<u>Title</u>	<u>Issue of Report</u>
Cajander, A. K.	The Scientific Foundation of Forestry as Exemplified chiefly by Forest Research in Suomi	November
Hough, A. F.	European Notes	November
Gillette, H. P.	Can Originality be Taught?	December
	<u>1928</u>	
Hotelling, Harold	Differential Equations Subject to Error, and Population Estimates	January
Hartley, Carl	How About it? (Stimulating seed production by medication)	February
Bruce, Donald	Suggested Procedure for Determining Cord: Cubic Foot Converting Factors	March
Kittredge, Jos. Jr.	Why Not Adopt the Metric System Now?	March
Siggins, H. W.	Seed Dissemination Study Proposed	March
Munger, T. T.	Editing Vs. Re-editing	April
Reid, E. E.	Incentives (From "Introduction to Organic Research")	May and July
Campbell, R. S.	A Research Viewpoint	June
Hunn, C. F.	The Preparation of Manuscripts	August
Boyce, J. S.	Sample Plot Observations	September

FOREST EXPERIMENT STATIONS

WASHINGTON

General

Outside of one short trip away from Washington on the part of Marsh, who visited the Taxation Inquiry in New Haven, the Washington office was completely assembled. Sparhawk attended the American Economic Association at Chicago, and Coville, Marsh and Chapline the American Association and Society meetings in New York.

Interbureau Meetings

Plans are under way for beginning the series of interbureau silvical forest research conferences such as were held last year. Because of the press of other work, the first meeting probably will not be scheduled until about the middle of January. It is planned again to cover the silvicultural field in a broad way and advantage will be taken of the presence of field men to bring up topics in their field in which the related phases of the problem will be brought out. Meetings will be held as often as may be deemed expedient.

Details

During the winter a number of details will be arranged to provide for carrying on some of the station work and to assist in the work of the Washington office. Gisborne, of the Northern Rocky Mountain Forest Experiment Station, is scheduled for an extended visit to Washington. J. H. Hanley, Central States Station, will work on the oak volume and yield study, and it is possible that we shall also have with us other members of the stations interested in the study before the winter is over. In addition to the volume table data taken during the past seasons, a search is being made of old records and files here to uncover other data which may be used to strengthen the weak points in the present study. With this material to supplement that collected by the stations, it is expected that we shall have for most of the species which are found associated with the upland oaks, adequate basis for the volume tables. Probably volume tables for 30 associated species will be necessary before the study is completed. To assist in the work of the Section of Forest Measurements, one additional temporary clerk has been engaged. The Section will undertake as little else during the winter as possible, in an endeavor to get well along with this badly needed study.

Legislation

As stated in the last issue, the House reported out the Agricultural Supply Bill for 1930 carrying some increases in accordance with the McSweeney authorization. The Senate did not have an opportunity of taking action before the holiday recess but hearings on the bill before the Senate Committees are to be held early in January. It is expected that the bill will be reported to the Senate before the first of February.

Library

In December the library loaned 923 books and periodicals, and 136 members of the Service and others consulted the library in person.

During the month, 246 books and periodical articles were indexed for the card catalogue.

NORTHEASTERN FOREST EXPERIMENT STATION

Boyce spent the early part of the month in the Washington office, working on his manuscript on "Decay and other losses in Douglas fir in western Oregon and Washington."

The month was an active one along Public Relations lines. Boyce addressed the Plant Science Club of Yale University, the Massachusetts Forestry Association in Boston, and the Society of American Foresters meeting in New York. Stickel gave an illustrated talk on "Forest Fires and Weather" before a meeting of the Worcester and Franklin Counties Fire Wardens' Association at North Dana, Massachusetts.

Westveld also attended the Society meeting in New York, and while in New York had an opportunity to confer with representatives of the International Paper Company on the prediction of future yields on cut-over pulpwood lands of various forest types in the spruce region.

Spaulding spent considerable time in cutting Douglas fir trees affected with canker, and in taking specimens of them. Two large lots of trees were cut at Ipswich, Massachusetts, which consisted of European larch, Douglas fir, and western yellow pine. This leaves but two estates in Massachusetts with diseased trees still standing, and cutting is now in progress on one of them.

CENTRAL STATES FOREST EXPERIMENT STATION

General

The staff of this Station has profited by the transfer of L. I. Barrett from the Southern Station. Although we regret that this transfer has reduced the experienced personnel of the Southern Station, we are very much pleased to have Barrett on our staff.

Since the field work extends to December in this region, computation of results will always be delayed too late in the winter if dependent on the field force. This leaves the Station handicapped in making up its new program early in the year. The solution of this seems to lie in the employment of a computing clerk who can work through the year. Steps have been taken to secure such a clerk.

Kellogg and Day did some work during the month on plans for their respective projects. McCarthy made a trip to Lexington, Kentucky, at the invitation of Dean Thomas P. Cooper to discuss the problems of research in that state.

Oak Study

Field work continued to the middle of the month in an effort to get the required volume table data. Kellogg and Coile made one trip to southern Ohio to secure measurements on trees in some rather limited felling operations. They also secured some very good pictures of the old charcoal blast furnaces of that section. Hanley, after finishing his work in Michigan, went with Coile into Pennsylvania where they secured a number of measurements on hickory.

Volume measurements covering chestnut and hickory have been assembled and sent to Washington. The time of the major portion of the staff has been occupied in the preparation of these field sheets.

Plantations Study

Kellogg sent out a number of inquiries to owners of plantations examined during the summer in an effort to secure advance information of any prospective cutting in these plantations. His purpose is to secure measurements on plantation grown trees for the construction of volume tables.

Visitors

O. A. Zimmerli spent four days at the Station going over the accounts, files and property of the Station. He expressed himself as pleased with the condition in which he found them.

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LAKE STATES FOREST EXPERIMENT STATION

During December the staff has been "crowded to the limit" by the exigency of completing reports on the projects undertaken in co-operation with the University of Wisconsin and the Wisconsin Conservation Commission, these reports being required as the basis of legislative action which will be sought in the current session of the Wisconsin Legislature.

Mitchell's report on Forest Fire Hazard as Affected by Weather Conditions, Forest Type, and Density of Cover comprises about 40 pages of text and covers the conclusions that can be drawn from one season's observations within the hardwood and jack pine types of northeastern Wisconsin. This report gives a very clear picture of the physical conditions affecting fire hazard in clear cut and uncut stands.

The report of Zon and Averell on Drainage of Swamps and Forest Growth is slightly over 30 pages long and embraces the facts which two men in seven weeks learned of the forest conditions in ten of Wisconsin's Drainage Districts. It goes without saying that the similar study carried out in Minnesota following the Wisconsin field work benefited by the experience gained in the earlier study. The amount of data gathered in Minnesota by six men in seven weeks along the 500 miles of drainage ditch inspected, quite overshadows in volume the amount of data from Wisconsin. However, whatever the Minnesota study gained from Wisconsin in experience was compensated for by the confidence one could place in the Wisconsin data, limited as it was in certain phases. The general conclusion of the Wisconsin report is that the 1691 miles of ditches designed as outlets for tile drain which were never laid, has been able to benefit less than 10 per cent of the Drainage District area. The small forested area affected by drainage and the heavy original cost of constructing the ditches which must be charged against the timber growth, make the Drainage Districts unattractive from a profitable forestry standpoint.

Zon and Scholz' report on How Fast Do Northern Hardwoods Grow, is the most voluminous of the three, and represents a very

creditable mass of measurements collected and assembled in record-breaking time. It shows clearly that the increased growth in suitable trees left in selective logging is of a most encouraging character, and the additional proof of this fact should do much to encourage a more general interest in forestry by private owners.

These three reports are in readiness for Zon to present personally to Dean H. L. Russell of Wisconsin early in January.

Gevorkiantz was busy the first part of the month putting the manuscript "Possibilities of Aspen Lands of the Lake States" in shape for publication as a University of Minnesota bulletin. During the last part of the month he has been helping Scholz with work of a statistical nature toward the completion of the report on "How Fast Do Northern Hardwoods Grow."

The principal activity of Bates during the month has been connected with pre-treatment tests of white pine seed to hasten the germination. This is a problem of considerable practical importance to nurseries. After considering the work that had already been done along this line with the five-needed pines, all of which show about the same germination characteristics, the conclusion was reached that it was not yet clear whether delayed germination was due to seed-coat permeability or the condition of ripeness of the seed. Therefore, the pre-treatment tests have been designed to cover both of these points, and, in addition, the possibility that partial failure of the slower-germinating seeds is due to their destruction by molds or other parasites. While it is too early to draw final conclusions from the germination tests which have followed the pre-treatments, it may be said that it is fairly apparent that all three factors are at work, but that uneven ripening of the seed, more than anything else, accounts for the wide "scatter" in germination. Strangely enough, considering the recent results of Miss Barton with the seeds of the southern pines, holding white pine seed at 0° C for ten days, as a preliminary to some of the other treatments, had no appreciable effect. Heating and soaking in sulphuric acid seem to be the two most promising of the treatments used. These must be followed out considerably further before it can be said to what extent they are applicable. It is believed, however, that by spring we may have some results which can be put into practice.

Bates has seized the opportunity offered by an invitation to meet with the Canadian Society of Forest Engineers in January to present the seed problems which are more or less common to all of the northern region, and has prepared a paper dealing with the larger aspects of these problems. This seems an opportune occasion

to present to Canadian foresters the need for a concerted effort to meet the situation created, for the most part, by the indiscriminate traffic in seeds between regions of unlike climates. This involves, of course, the entire question of hereditary qualities transmitted by seeds, and in addition, factors affecting the germinative quality are dealt with.

Zon will be in the East most of the month of January, delivering lectures at Syracuse, Cornell and Amherst, and visiting, in addition, the Harvard Forest, Bussey Institute, Yale Forest School, Allegheny Forest Experiment Station, and Washington. During his absence the entire staff will attempt to bring its loose ends together and get "straightened out" from the recent hectic period of report writing. The principal general activity will be the formulation of project plans for the new year, so that the formal Program may be made up soon after Zon's return. Mitchell will now be able to turn to the compilation of the Michigan statistical fire data, while Averell will continue work upon the Minnesota swamp drainage study.

APPALACHIAN FOREST EXPERIMENT STATION

Frothingham, Korstian, Beal, Buell, MacKinney, and Abell attended the meeting of the Appalachian Section of the Society of American Foresters in Raleigh, N. C., on December 10 and 11. The subject "Aside from fire protection, what does forestry in the Southern Appalachian region need most" was discussed from several angles at one session; "Commercial and Legal Standards for the Measurement of Timber and Other Forest Products," at another; and one afternoon there was an excursion to the State nursery and to an interesting even-aged stand of loblolly and shortleaf pine in the vicinity of Raleigh. Among the resolutions passed was one urging that steps be taken by the eastern sections of the Society to formulate a unified forest type classification for the eastern United States, particular emphasis being put on those types common to the territories of two or more sections.

On the return trip MacKinney, Buell, and Abell stopped at Fayetteville planning to make a seed dispersal test of loblolly pine at the Palestine fire tower, but there was not enough wind.

The Station was represented at the meeting of the Society of American Foresters in New York by Director Frothingham, who has been a member of the Society's Executive Council for the past five years. He spent two days in Washington on his way back to Asheville. Dr. Hursh, who was on leave, attended the New York meetings of the American Association for the Advancement of Science.

The entire month in the office has been spent on routine computation work on the projects dealing with the methods of cutting in hardwoods and increased growth of loblolly pine after cutting. The data on one phase of the latter project has been summarized and sent to the Washington Office to be put through the sorting and tabulating machines.

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ALLEGHENY FOREST EXPERIMENT STATION

A number of the staff members attended the meetings of the A.A.A.S. in New York, and all reported the sessions as exceptionally worth while. The subsequent field trip into south Jersey, to see some of the experimental work under way on the state forests, was attended by about 18 men from outside the state and their enthusiasm over what they saw amply repaid Forbes for proposing the trip.

Mr. Alfred Gaskill, formerly State Forester of New Jersey, called to acquaint himself with the station work.

Two staff meetings were held, which gave an opportunity to hear Berg discuss forestry conditions and practice in Norway. His description of the Norwegian technique of laying out sample plots was particularly interesting.

Management

Hough continued his analysis of the Mc measurements taken on the Little Arnot plots, and Lutz completed the computations incident to preparation of a report on the Heart's Content area in the Allegheny National Forest.

Wood continued his inventory at Camp Ockanickon, with the assistance of Berg, Thatcher and Godfrey. The lowest age class (0-10 year) has been covered by a 30 per cent survey. This age class occupies about 60 acres on the tract. The cold rainy weather has greatly hampered this work.

Mensuration

Schnür continued his work on volume studies throughout the month, checking field data and drafting curves on forms. Yale students copied for our use volume table measurements for several hundred trees needed in the oak study.

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SOUTHERN FOREST EXPERIMENT STATION

The month was marked by changes in personnel. Professor G. H. Lentz completed his year's work in the hardwoods investigations, and returned to Syracuse. Barrett left December 15 for the Central States Station, after two and a half years at the Southern. All of us sincerely regret his departure, and the staff is weakened no small amount by the transfer of his personal ability and keen critical faculties to another territory. In pleasant contrast to the departure of Lentz and Barrett is the arrival of Paul V. Siggers, of the Bureau of Plant Industry, to start systematic work on forest tree diseases in the southern pine region.

Demmon spent the first few days of the month in western Louisiana and in Texas, and then left for Madison and for the New York meetings.

Measurements

Barrett and Righter attempted to check volume tables against field data at Urania, but found that Table 75, in Eastern Conifers, although closer than the new second growth table on the one plot tried, still did not apply within Bruce's limits.

Management

Barrett and Righter, with the aid of a temporary helper, completed the establishment of the Nelson and Whitehead thinning plots at Urania, and constructed fire lines around these and most of the other Urania plots. They also remapped the crowns, originally mapped five years ago, in the thinned plot in the Deer Pasture, and made the annual cone counts on the Maxwell thinning plots, as well as for the reproduction study in the Greeley Pasture.

Barrett and Righter attempted to trap the animals eating the longleaf seed on the unburned portions of the Chapman Forest, but with little success.

Naval Stores

At Starke all trees with faces and all checked trees which have been unturpentined were raked during the month of December, except Dukes tract. It is not necessary to rake the trees at Dukes because they are entirely surrounded by plowed fields. The Kingsley Lake tract has been surrounded with a fire line; this tract will be kept unburned if possible. The Sampson and Union tracts will be burned over at a favorable time because it is out of the question to keep them unburned.

An analysis of our test of the effect of fertilizer on gum yields was worked up and the general results obtained were sent in to Mr. J. N. Harper, to whose interest we are indebted for the fertilizer.

An examination of a 12,000-acre tract of timberland about 12 miles from Starke was made at the request of Mr. Ashe. This land and timber looked good for experimental work.

Seven burned turpentined faces were screened in at Kingsley Lake. It is expected that emerging turpentine borers will be collected from these cages in the spring and transferred to two other large cages which have been placed over young sapling trees so that the insects may feed on the foliage. When they have fed for some time they will be taken out and placed on other turpentine faces in order to get information on the life history of the beetles.

Dr. Gerry returned to Madison after having spent about two weeks at Starke. During this time she collected a good deal of material to work on. Dr. Cary was at the Starke office off and on during the month. J. A. Beal of the Bureau of Entomology spent two or three days at Starke assisting in the building of cages for the collection of insects. Officers of the Durham Tropical Lands Company visited the Kingsley Lake tract during the month.

Forestation

Most of Wakeley's work, including a week of mapping at Bogalusa and a two-day conference with Professor Hayes at Baton Rouge, was on the commercial planting bulletin, by Hayes and himself. This publication is now almost ready to go to press.

At Camp Pinchot Gemmer and Silcocks prepared the new nursery beds and transplanted the exotics. They also put in this year's longleaf and Monterey pine plantations, including one plantation on an annually burned fire line and one on freshly plowed ground, all with selected, locally-grown stock, with roots pruned to 10 inches. They made some replacements in last year's slash and Monterey pine and put in the necessary fire lines around the plantations.

Protection, Others

Gemmer reports grasshoppers defoliating longleaf transplants at Camp Pinchot.

Hardwood Investigations

Lentz completed the last of his six reports on various portions of the Louisiana hardwoods region, together with a summary of work to date in the hardwood study, and recommendations for future work.

Pathology

Siggers spent the greater part of the month in the office, on reference work. He also made the first detailed examination of individual seedlings on the brown-spot plots in the 800-acre burn and on the fire break at Bogalusa, and began work on the spraying plots laid out last spring by Wakeley under Dr. Hartley's directions.

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CALIFORNIA FOREST EXPERIMENT STATION

General

Because of the very heavy losses to grain and range land last summer the Governor appointed a committee of his cabinet to investigate the problem and to determine ways and means of holding such losses in check in the future.

Under the auspices of the Division of Agricultural Engineering of the University of California a meeting of three sub-committees was called together at University Farm on September 12. The Committees considered the establishment of equipment for rural fire districts, public relations, and legislation. As a result of this conference a very definite step in better fire protection may be expected in rural communities bordering the brush land areas of the state and will be of direct benefit to the protection of the watershed areas and national forest lands.

Management

Mc. Work on the methods of cutting summaries was continued during December with some interruptions for annual leave and holidays. Gustafson and Sinkevitch are compiling the current remeasurements for the eight Plumas plots at Massack. They have been handicapped by failure of the supply of record forms, but summaries for the third 5-year progress reports will soon be ready.

Dunning completed compilation and progress reports for the two Lassen plots in east side western yellow pine and the Cow Creek area on the Stanislaus. The latter area, one of our most intensively studied plots, has had an unfortunate history. Three wind storms and insect attacks caused a net loss in volume for the first 5-year period and growth of the surviving trees was low, partly because of repeated dry seasons.

Mr. Summaries were completed for the 100 mil-acre quadrats and 60 screened and unscreened plots on the clear cut sugar pine - white fir area, Stanislaus. The quadrat maps were put in good shape by Gustafson.

Hansen, on detail from the Lassen, has assumed the drudgery of redrafting the 200 mil-acre quadrat maps for the Cow Creek, Stanislaus.

Cover Types

With the completion of Santa Cruz County early in December, field work was suspended for the winter. Tyrrell and Wright spent the remainder of the month in summarizing type areas of the Sierra region by counties.

The type data so far secured is already finding a field of usefulness. Coffman, former Supervisor of the California National Forest, and now with the National Park Service, has been using the type maps of the Lassen, Yosemite, and Sequoia national parks in connection with the preparation of fire protection plans for these parks. Frederick Law Olmstead has used our data in connection with a report he is making to the State Department of Natural Resources covering a survey of the State's needs for parks. Mr. Clar is now compiling from our data a land classification to be used by the State Forester in planning adequate statewide fire protection under provisions of the Clarke-McNary Act.

National Forests. During the month Kotok and Wieslander participated in a conference with District Office officials in which it was decided to push the revision of the National Forest type maps. Dunston of the Office of Forest Management will make a trip with Wieslander during January to start the work on six of the national forests.

Southern California. At the same conference it was decided to detail two qualified assistant rangers from northern forests for typing on the San Bernardino during the period January 16 to March 31. The State Forester is also cooperating to the extent of assigning one of his inspectors and a car to this job for the same period.

Surficial Run-Off and Erosion Studies

The two surficial run-off installations in the Devil Canyon area were visited by Lowdermilk in the early part of December to inspect and adjust the instruments. Neither the storms of November nor of December 2 and 3 were of sufficient intensity to deliver run-off into the recorders. Run-off was recorded, however, in the storms of December 12 and 13.

Wind erosion was quite noticeable on the burned plots of the Devil Canyon Installation No. 2. The collecting troughs filled with wind-blown materials. The amount of ash and dust blown beyond the limits of the plots of course could not be determined. This experiment indicates that the movement of material as ash and fine dust following forest fires in southern California must be important.

In addition to wind erosion, gravity erosion is much in evidence on the steep slopes in cones of dried soil slides where the removal of vegetation and its litter by fire has allowed dry soil to assume its angle of repose. Wind and gravity erosion usually have time to take place before rains of sufficient intensity occur to produce surficial run-off and water erosion.

Water Cycle Studies

The data from the water cycle studies are being worked up and checked. Plans for a cooperative study between the California Forest Experiment Station and the Division of Forestry in a continuation of the water cycle studies with reference to the effect of a cover of vegetation on erosion have been made.

General Erosion Studies

Two erosion areas were visited by Lowdermilk. (1) The scene of the Burbank flood of November 14, 1928, in company with Messrs. Hay and Goodridge of the Los Angeles Flood Control District and (2) the Kennet Area in company with Dunning and Wieslander.

The Burbank flood among other things suggests the importance of scrutinizing the evidence of outwashed boulders of great size as indicating former wet cycles of precipitation. Fortunately a standard rain gage was located in the center of the Sunset Canyon and registered 0.59 inches on November 13 and 1.07 inches from 6:00 a.m. to 9:00 a.m. on November 14. It was the rain of the morning of November 14 which on adjacent areas reached no greater intensities than 1.7 inches in one hour, that produced a serious flood flow of water, mud, and boulders. It is possible that evidences of former floods may be more directly referred to the condition of the watershed than of cycles of precipitation. At least this possibility requires consideration in all predating of precipitation cycles on the basis of erosional phenomena.

The much described and pictured Kennet area contains many fields of inquiry. As an example of what the comparatively sudden removal of vegetation (by smelter fumes) over an area of about 100 square miles in steep topography will do in affecting the geologic norm of erosion, the Kennet area stands preeminent. It is a great pity that the run-off factor from this area was not measured from the first. The opportunity still exists to determine the run-off factor of watersheds devoid of vegetation or with the first stages of vegetative succession, and to follow the changes in the run-off factor as vegetative succession reclothes the area following the shut down of the smelters.

The first stages in vegetative succession on the seriously eroded areas proves to consist of shrubby growth such as Rhus diverseloba and Arctostaphylos viscida rather than herbaceous species. The Kennet area furnishes an ideal location for erosion, run-off, and erosion control studies for northern California conditions.

Reforestation

Although the spring of 1928 was favorable for starting plantations the young trees were subjected to heavy losses during the latter half of July when California experienced a period of severely hot weather. About 300 trees planted in the arboretum at Quincy were all alive on July 1 and all dead on July 31. A plantation on a 1927 burn near the Feather River Station suffered a 50 per cent loss. There is only one bright spot in the 1928 planting report. A plantation of 2-0 western yellow pine on a steep northeast slope at 550 feet elevation shows a 90 per cent survival and excellent growth. The planting area was part of a denuded high lead landing on the property of the Pickering Lumber Company. The soil was deep and loose, of granite origin. Planting was done by unskilled labor under Siggins' direction.

The surplus stock raised at the Devil Canyon Nursery and not needed for experimental purposes by the Station was distributed to the following cooperating counties:

<u>County</u>	<u>Number of trees</u>
Orange.	3,000
Riverside	3,000
Santa Barbara	4,000
San Bernardino.	6,000
San Diego	8,000
Total.	<u>24,000</u>

Most of this stock will be outplanted in January and consists chiefly of Coulter pine with some western yellow and sugar pine. Our agreement with the cooperative agencies provides for use of surplus stock by them in return for support of our entire southern California research program. Outplanting done, however, by these agencies will be of material assistance in procuring further data as to methods and success of planting from the general southern region.

Products

Annual leave and miscellaneous jobs cut heavily into December in Products. Mr. Brundage also went into the hospital on December 11 for an operation for appendicitis, from which he is now recovering very satisfactorily and expects to be back at his desk the second week in January. The only major project work of the month was that on blue stain on which the field work was finished by Brundage. Preparations are under way for the lumber census, on which active work will commence in January.

Entomology

N. T. Mirov has completed two reports on his past season's work, one on attraction studies with the western pine bark beetle and the other on variations in the morphology and chemical composition of the oleoresin of western yellow pine as related to susceptibility to attack by the western pine bark beetle. The results of the first of these studies indicate that the carbohydrates of the phloem and the products of their fermentation are much more important as attractants of the western pine beetle than the oleoresin of the bark and wood. Mr. Mirov's temporary appointment with the Bureau of Entomology terminates this month, but it is hoped that arrangements can be made by which he will be enabled to continue his studies at a later date.

Person, besides spending a considerable amount of time helping with the trees above mentioned reports, is still working on the report on sample plot studies on the selection habits of the western pine beetle, which he hopes to complete early in January.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Director in the East

Mr. Munger left the last of the month for the East to assist in getting ready for publication three Station reports, which have lately been going through the mill, the authors of all of which are also East this year. The proposed bulletins are:

The Growth of Douglas Fir in Western
Oregon and Washington - by R. E. McArdle

Slash Disposal in the Yellow Pine
Region of the Northwest - by R. H. Westveld

Predicting Yields of Average
Stands of Douglas fir - by W. H. Meyer

Munger also planned to attend in New York the annual meeting of the Society of American Foresters, of which he is a member of the Executive Council.

Douglas Fir Natural Reproduction Study

While all phases of the work are still far from complete some interesting side lights are beginning to show up. A soil analysis made by the Soils Department of the Washington State College of Agriculture indicates that an intensely hot slash fire temporarily changes the soil structure. It reduces the humus content of the upper $2\frac{1}{2}$ inches of soil by 50 per cent, and, in addition, leaves the inorganic colloidal material in a changed form. Both the organic and inorganic colloidal material have a tremendous water-holding capacity and with both temporarily destroyed, tree seedlings may not survive the usual period of summer drought. In a humid climate the inorganic colloidal material should be fairly well restored to its natural condition by weathering in a period of four or five years, thus restoring in a large measure the natural water-holding capacity of the soil. This analysis offers a possible explanation of the delay in restocking when other conditions appear favorable, which frequently occurs in the Douglas fir region.

Computations

Kolbe spent the greater part of the month getting the computations on the permanent sample plots up to date. A general summary was made of the data collected by Meyer this past summer for the yellow pine growth study. Ranger Moravets worked with Kolbe on the preparation of a progress report for the yellow pine methods of cutting plots which were established by Westveld in 1926 on the Crater National Forest. There are four ten-acre plots in this Forest and they serve the dual purpose of giving data for the methods of cutting study and additional data on methods of slash disposal.

Fire Studies

Simson closed the station at Wind River and came to Portland the first of the month. His time has been pretty well divided between compilations of the static lightning study and the snag falling study. In connection with the snag falling study, it was interesting to note that there was a marked flattening of the sawing time curve for snags in the 50-60 inch class and a decrease in the boring time on snags in the 50-60 inch class over that of the 40-50 inch class. That these irregularities in the curves are due to accidents of sampling seems rather doubtful. Perhaps the explanation lies in the wood itself.

Fifty Four Pinuses

A check of the Wind River Arboretum shows 54 different species of pine growing there this fall, ranging from 1 to 16 years of age. Some are rather tender species and may not survive indefinitely. "The Handbook of Coniferae" (Dallimore and Jackson) lists for the whole world 71 species of *Pinus* (not including varieties) but many of those are too tropical in their tastes for the Wind River winters, so our collection of the pines has already assembled most of the species that are likely to survive there.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

A thorough working-over of the project files of the reproduction and methods-of-cutting studies was accomplished in December. In addition to putting the data in orderly shape, this job has served to emphasize two facts: first, that considerable work is needed in 1929 to complete the file records by the inclusion of certain establishment reports, tie surveys, maps, and more detailed plans of work; and second, that this station has under way an unusually large volume of research covering reproduction and methods-of-cutting, but particularly in the way of permanent reproduction plots and quadrats. The current field work on the plots of these projects, in fact, now requires the full time of one station man and two field assistants for five months to make the annual and periodic examinations. This was foreseen when the work was undertaken several years ago, but the necessary reduction of our staff by one man this year in order to meet increasing expenses was not anticipated. In order to carry on the permanent sample-plot work from now on, it will very likely be necessary to drop our yield and cut-over area studies.

Weidman and Haig attended the annual meeting of the Northwest Scientific Association at Spokane, both men giving papers, the titles being respectively "What is Research?" and "Accuracy of Quadrat Sampling in Studying Forest Reproduction on Cut-over Areas." At this meeting Weidman was elected chairman, and Haig secretary of the forestry section of the Association for 1929. After the meeting, Weidman spent a few days at the Priest River Branch Station reviewing the work of the new resident officer, J. B. Thompson, and helping him prepare his work plan for the next five months and his branch station allotment estimates for the next fiscal year.

In his paper at the Spokane meeting, Weidman confined his remarks on the subject of what is research chiefly to pointing out the distinctions between research and the closely related forms of scientific inquiry which are often confused with it. In this region, as elsewhere in forestry and other fields of scientific work, research is a much-used and loosely used word. There is need here for better understanding of the meaning and use of the words research, investigation, study, and experiment, in order that those engaged in planning and administering forest research programs may do so more intelligently and with a view to better coordination of regional efforts by the different forest agencies.

Haig's paper on the adequacy of quadrat sampling was based on the results of his analysis of data secured during the past year. Haig found that the field method used in studying reproduction on cut-over areas, in common with most transect studies of this nature, gave a very small sample, in this instance only one-tenth to eight-tenths of one per cent of the total area, and it was obviously desirable to check the results. In general, the quadrat method was found to give satisfactory values for both frequency index (percentage of total area stocked with seedling reproduction) and for average number of seedlings per acre. In checking values for average number of seedlings per acre, considerable difficulty was encountered due to the J-shaped character of the frequency distributions, for the usual statistical check of average values cannot be applied to this type of distribution. Methods were evolved for converting these J-shaped distributions, probably common in similar ecological and silvical studies, into more normal distributions so strengthened as to permit the application of the probable error concept with a reasonable degree of safety.

The analysis of the twice-daily measurements of fuel inflammability and weather, for the past four fire seasons, developed some new information bearing on the choice between broadcast-burn and pile-and-burn slash-disposal methods, which was prepared as an illustrated article and submitted to the Timberman for publication. It has been

generally recognized in this District that broadcast slash disposal nearly always kills the residual stand and thereby creates more fuels than are consumed, but the important effect of removal of the shade of the residual stand had not before been measured. Our data show that for equal periods of time on comparable sites, an area with all the shade removed experiences from 8% to 10% more days when fire will spread through the fuels on the ground, and that the highest degrees of inflammability - when chances of disastrous fires are greatest - prevail from 8% to 10% more often than on a timber-sale area where about half the original full canopy is retained in a living residual stand. The article stresses the financial importance of this lengthening of the fire season and the increase in the degree of inflammability.

The analysis of duff-temperature data for the 1928 season - the first time such measurements have been made in District 1 - brought out one rather startling indication. The summarized data are shown in the following table:

Month	Air Standard Exposure	Average Maximum Temperatures		
		Clear-Cut Area	Half-Timber Canopy Area	Full-Timber Canopy Area
1/4 inch below surface of the duff				
June	73° F.	94° F.	84° F.	64° F.
July	84	110	105	71
August	82	106	100	69
Averages	80	103	96	68

For several years we have been trying to correlate the moisture content and inflammability of duff and slash with air temperature, humidity, etc., without measuring the fuel temperatures. A mere glance at the above table, showing an average maximum duff temperature of 103° F., occurring with an average maximum air temperature of 80° is sufficient to show the futility of such a hope, especially when one realizes that at 103° F. the rate of evaporation of moisture is more than double that which would be estimated on the basis of an air temperature of 80°. Other investigators have been measuring duff temperatures for several seasons, and we had been told that the results were "very interesting." It is regrettable that the extreme importance of such measurements was overlooked, and it is hoped that others will not overlook this factor in similar problems for as long as we have. It is also hoped that others who discover the importance of similar factors will call the discovery to the attention of all stations.

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MANUSCRIPTS RECEIVED

Lake States

Forestry and the Agricultural Crisis. Raphael Zon. (For Annals of the American Academy of Political and Social Science.)

The Scrub Oak Forests of Northern Michigan. Kittredge and Chittenden. (Joint Bul. to be published by Mich. State Col.)

Drainage of Swamps and Forest Growth. Raphael Zon and J. L. Averell.

How Fast do Northern Hardwoods Grow. Raphael Zon and H. B. Scholz. (To be published as bulletin of the Wis. Agri. Expt. Sta.)

Forest Fire Hazard. J. A. Mitchell. (To be published as bulletin of the Wis. Agri. Expt. Sta.)

Southwestern

Climatic Cycles and Tree Growth. G. A. Pearson (Rev. of Douglass book) (Jour. Forestry)

Central States

Forests Follow the Charcoal Burner. Ralph K. Day. (Empire Forester).

Northern Rocky Mountains

The Effects of Brush Disposal on Later Protection Costs and Losses. H. T. Gisborne. (For Timberman).

Southern

Survival and Early Growth of Planted Southern Pine in Southeastern Louisiana. Ralph W. Hayes and Philip C. Wakeley. (To be published by University of Louisiana.)

Appalachian

Effects of Litter on Soil Temperature and Soil Freezing in the Forest in Autumn and Winter. A. L. MacKinney. (For Ecology)

IN PRINT

Demmon, E. L. Forest Research in the South. Southern Lumberman Dec. 22, 1928.

Demmon, E. L. What the forest fires of 1929 did to the pines on Georgia cut-over lands. Naval Stores Review. Dec. 1928.

Buell, J. H. What can be Done with Southern Appalachian Cut-over Areas? Southern Lumberman, Dec. 22, 1928.

Munger, T. T. Slash Disposal in the Pine Operations. The Timberman, November, 1928.

Munger, T. T. From fern to forest. The Timberman. November, 1928.

McCarthy, E.F. Forests in Relation to Flood Control in the Mississippi. Proceedings of the American Society of Civil Engineers, January 1929.

Hursh, C. R. Litter Keeps Forest Soil Productive, Southern Lumberman, Dec. 22, 1928.

Putnam, J. A. The Occurrence of Heartwood and Figure in Red Gum. Southern Lumberman, Dec. 22, 1928.

" " " Butt Swell in Southern Swamp Hardwoods. (Southern Lumberman, Dec. 22, 1928.)

Vining, L. D. Damage Resulting from Recent Florida Hurricane to Second-Growth Turpentine Timber. (Naval Stores Review, Dec. 15, 1928).

Wyman, Lenthall Conservative Turpentining the Key to Forest Prosperity. Southern Lumberman, Dec. 22, 1928.

Wakeley, P. C. Testing the Quality of Pine Seed. Southern Lumberman, Dec. 22, 1928.

OFFICE OF FOREST PRODUCTS - District One

Woods Waste in Logging

Considerable field work has been accomplished on this project during the past season. Mr. Anderson started at the Potlatch camps in Idaho in April and was joined on June 10 by a field assistant who worked until September 1. The inventory of the waste was made in identically the same manner as a check timber cruise is made, using the 1/5-acre plot system. Practically 75% of the work was done immediately after completion of skidding and prior to slash burning.

Sufficient field data for the white pine type have been gathered, but some work yet remains in the yellow pine, larch-fir, and lodgepole types. Four hundred and thirty-nine fifth-acre plots, or 88 acres, were cruised in the white pine type in seventeen different camps located so as to give a good average for the type. Two hundred and nine plots, or 42 acres, and 25 plots were tallied in the yellow pine and lodgepole pine types, respectively. Approximately 200 more plots will be required for the yellow pine type, 75 for the larch-fir type, and 100 for the lodgepole pine type, which will require about 30 days of effective field time for one man.

During the course of the study, it developed that a stump cruise of the timber removed from the area by logging was desirable in order to secure a comparison of the merchantable material removed and the wood waste left per acre. This called for a method of converting stump measurements to d.b.h. measurements. The following table of converting factors was devised for western white pine and while its principal purpose is for interpreting data in this study, it will be found useful in timber sale work in the white pine belt wherever stump scales are necessary.

Number	Tree	Stump	For D.B.H. Use
Measurements For	D.I.B.	Following	
Each Group		Deduction	
		Inches	Inches
		10	
111		to	1
		14	
		15	
144		to	2
		19	
		20	
128		to	3
		28	
		29	
28		to	4
		32	
		33	3
14		and	or based on condi-
		up	tions on ground

The table is applicable to stumps 18 inches high and lower. In the average case for stumps not seriously contorted because of defect and physical injury and over 18 inches in height the stump D.I.B. may be used for the D.B.H.

The decline in taper in those trees having a stump D.I.B. of 33 inches and over is attributed to irregularities in the first 6 or 8 feet of the bole caused by stump rot and *trametes* conks. Since most white pine trees over 33 inches on the stump are defective, the normal taper of the tree is reduced by the protrusions caused by conks, especially for the first 6 or 8 feet of the bole where stump rot and *trametes* fruiting bodies are most apt to emerge.

Measurements of 562 yellow pine stumps were made (woods run) and the final tabulation indicated that for the purpose of making stump cruises the stump D.I.B. could be used as the tree D.B.H.

Waste in Gravity Chuting

While making investigations prior to the inauguration of this study, it was found that there is a serious loss in chuting over the steeper gravity chutes. On the Kootenai Forest 400 white pine logs running 8-1/3 logs per M were checked over 1,300 feet of chute running from 40% to 60% in grade containing chisel point goose-necks to check and hold the logs in the chute. The loss in scale was approximately 7% and was due principally to brooming, splits, and breaks, since the goosenecks were too widely spaced.

D-1 Investigative Committee to Meet

The report of the committee on organization and functions of the D-1 Investigative Committee was received during the month and status sheets covering each project to be carried on during 1929 were prepared and submitted to the secretary. A status sheet for each continuing and new project was prepared which contained the following information: designation and character of the project, its scope and status, further work necessary, date of completion, and assignment. Eighteen copies were prepared. Similar status sheets were submitted by all the agencies in this District which carry on research in forestry or allied subjects.

Forest Service membership in the committee includes representatives of the Northern Rocky Mountain Experiment Station, the D-1 Office of Forest Products, Office of Management and Planting, Office of Operation (Fire Studies), Office of Grazing, and a Super-

visor from one of the district's forests. The District Forester acts as chairman of the meetings. The Bureau of Plant Industry (Blister Rust Investigations), the Bureau of Entomology (Forest Insect Investigations), the Weather Bureau, and the Forest Schools of the University of Montana and Idaho, as usual, will have representatives at the meeting.

The 1929 meeting of the D-1 Investigative Committee is to be held on January 10, 11, and 12, at the University of Montana Forest School Library in Missoula.

Annual Census of Lumber Production Gets Under Way

All of the schedule forms necessary in making the annual lumber census in the States of Idaho and Montana were received during the month. The Supervisors' sawmill report submitted annually and used in correcting the mailing lists have all been received. The first call for statistics from the mills will be made shortly after January 1. Mr. C. N. Whitney will be in charge as a special agent of the Bureau of the Census.

Lumber Prices and Movement

Av. Mill-run Prices	*Annual	*Annual	First Q.	Second Q.	Third Q.	Nov.
	1926	1927	1928	1928	1928	1928
Idaho White Pine	\$37.77	\$35.86	\$30.20	\$31.00	\$31.00	\$33.14
Western Yellow Pine	26.33	25.17	26.55	25.52	26.08	25.20
Larch-Fir	17.78	18.19	17.60	18.23	19.23	18.91
White Fir	19.10	17.41	17.89	17.35	18.75	21.71
Spruce	23.75	23.39	24.35	21.21	22.69	24.88

* corrected figures for Annual, 1926, and Annual, 1927.

Shipment and Cut	November, 1927	November, 1928
Shipment	115,295	132,194
Cut	110,302	142,376

OFFICE OF FOREST PRODUCTS - District Six

General Survey of Wood Waste in Logging in the Douglas Fir Region

Mr. Hodgson continued with the revision of his report which has been reviewed by a number of local Forest Service officers. The entire month was devoted to this activity by him.

Logging and Milling Studies in the Western Yellow Pine Region

Mr. Johnson applied most of his time during the first ten days of December to computing the data secured in the Shevlin-Hixon Company mill study.

Mr. Spelman's time during the first ten days of the month was devoted to the felling and bucking time study at the Shevlin-Hixon Company.

Publications

Mr. Hodgson's paper entitled, "Logging Waste for Pulp Wood in the Douglas Fir Region," which he presented in October at the Pulp and Paper Conference at Seattle, was printed in the December issue of The Timberman.

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REPORT OF THE FOREST TAXATION INQUIRY

The collection of data in the Pacific Northwest was completed during this month, except for a small amount of clerical work not requiring technical supervision which remained to be done during January by temporary employees. The excellent condition of the county financial records in the State of Washington shortened Allin's work so as to permit its completion in advance of the estimated time. Hall and Allin both returned to headquarters during the month.

At the New Haven Office, Fairchild, Murphy, and Herbert devoted a large part of their time to completing the abstracts of state forest tax laws. Pingree has been revising some office reports by Chapman presenting data obtained in the Minnesota study for publication as Progress Reports. The rest of the office force, with help from Herbert, Murphy, and Hall, has been engaged in working up the New Hampshire and Pacific Northwest data in the hope of providing some preliminary compilations at an early date.

Many of the force were on leave during the last half of December. This includes Hammar, who will not be on duty again until next July, having been granted leave of absence without pay for the first six months of 1929 in order to permit him to continue his work for a doctor's degree in Economics at the University of Minnesota.

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RANGE RESEARCH

Washington

Toward the end of December the office was almost deserted with Chapline at the New York meeting and most every one else off on annual or sick leave. Work in the early part of the month, however, appeared to be so strenuous that doubtless the same amount was accomplished and the vacation should have benefited all.

American Association for Advancement of Science Meetings

W. R. Chapline from the Washington Office and R. S. Campbell from the Jornada attended the meetings in New York City from December 27 to 31. Chapline presented a paper "Range Research of the U. S. Forest Service," illustrated with slides in the symposium "Pasture Management Research" held by section O (Agriculture) jointly with the New England Section of the American Society of Agronomy. The symposium brought out rather definitely that pasture management research in the East has not taken on the ecological character which characterizes much of our range research. They have, however, gone further in soil and nutrition studies. Doubtless we can learn a good deal from them in these phases when we are in a position to expand along those lines.

Campbell gave a very interesting paper illustrated with slides before the Ecological Society of America, entitled, "The Prosopis Sand Dunes of Southern New Mexico" in which he discussed some of the successional trends brought out by his studies on the Jornada. An ecological research conference was also held under the direction of Dr. H. L. Shantz, President of the University of Arizona and also President of the Ecological Society. The discussion, however, was largely so general that it did not point out very many phases that would be of direct benefit to our range research work. Considerable emphasis was placed on the role that soil development plays in plant succession.

The contacts and discussions that one can have at such a meeting are, of course, the main return. It is hoped that the discussions with professors of forest schools and botany departments will have a wholesome effect on the better understanding of the type of men needed in our range management work of the Forest Service.

Campbell Pays us a Visit

R. S. Campbell of the Jornada stopped off in Washington for a day enroute to the New York meetings of the American Association for the Advancement of Science. Arriving the day after Christmas, many of the people in the office were out but a number of conferences were arranged with members of the Bureau of Agricultural Economics and Biological Survey as well as the Forest Service to consider problems particularly affecting the Jornada.

Appropriations

The President's budget was presented to Congress early in the year which shows a total increase of \$17,245 for range investigations of which \$14,320 is the net increase for the Intermountain Region, the balance being Welch Act adjustments. Congressman Colton of Utah appeared before the House Committee and made a very impressive statement in support of the range research item. The House Committee made no change in the item and the bill as it passed the House was exactly the same as provided for in the budget.

Congressman Buchanan of Texas became very much interested in the soil erosion work of the Department during this past year and offered an amendment in the House providing for \$160,000 additional "to enable the Secretary of Agriculture to make investigations of the causes of soil erosion and the possibility of increasing the absorption of rainfall by the soil, and to devise means to be employed in the preservation of soil, the prevention or control of destructive erosion and the conservation of rainfall by terracing or other means." Chapline attended a number of conferences of the Department in connection with this and at one called by Congressman Buchanan outlined the character of the erosion work that the Forest Service has been doing in the past and should continue to do. Although the item was added to the Bureau of Chemistry and Soils appropriation, Mr. Buchanan and the Department expect that the Secretary will make available part of it for erosion research by the Forest Service and Bureau of Public Roads.

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FORAGE INVESTIGATIONS

Work on the revision of the grass distribution list, by Miss Hayes, has been almost finished and plans for a similar revision of

lists for the plants of other forage groups have been started. 82 plants, representing 2 collections, were sent to the Bureau of Plant Industry for formal identification. 80 plants were mounted, 100 new genus folders were added to the herbarium, and about 500 specimens added to the herbarium.

The manuscript of the artificial reseeding bulletin was returned to Washington by Forsling and it is expected to have it shortly on the editor's desk.

Miss Hayes has taken over the handling of the laboratory phases of the motion pictures which are being taken of the germination and growth of some of the forage grasses to be used in the sheep range and cattle range management movies. By the use of special apparatus the growth of the roots below the ground surface will be shown as well as that of the blades above ground, and half or more of the plant is to be found in its root system. In addition to this root and leaf development, an attempt is being made to catch with the camera's eye the respiration or breathing of the plant as shown by the opening and closing of the minute pores (stomata) of the leaf surfaces.

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GREAT BASIN EXPERIMENT STATION

Completion of Field and Laboratory Work

The month of October was spent in cleaning up loose ends of field work on the various Station projects and in the laboratory completing the weighing of forage yield samples.

Detail

C. L. Alleman was detailed to the Station for the month of October to assist in the completion of the field and laboratory work.

Change to Winter Headquarters

The permanent members of the staff moved from the Station near Ephraim on October 26 to the winter headquarters in Ogden.

Trips

Forsling spent ten days the early part of November on a trip to the U. S. Range Livestock Experiment Station near Miles City, Montana, where he conferred with E. W. Sheets, Chief of the Animal Husbandry Division, Department of Agriculture, members of the Station, State and Forest Service representatives on preliminary plans for the conducting of range management experiments at that Station. Trips were made out over the Station pastures in order to get a better idea of the range lands and how best they might be managed.

Forsling, on his return to Ogden, stopped at the U. S. Sheep Station at Dubois for a conference with Mr. Denecke.

General

During November, Forsling completed the report on his September trip to the Boise National Forest, which was mainly to study the erosion complex on Arrow Rock reservoir watershed.

In view of the marked interest being shown in the erosion problem throughout the country, the field data for the years 1926-27-28 of the erosion and streamflow project are being completed and analyzed for inclusion in Forsling's manuscript on "The Relation of Herbaceous Vegetation to Surface Runoff and Erosion on High Mountain Watersheds."

Preliminary plans for the winter have been made which involve the compilation of the past field season data and further compilation and analyses for several years back of data of important projects. A progress report on the effect of climate upon plant growth which involves 5-year's work will be carried to completion.

JORNADA RANGE RESERVE

Range Conditions and Precipitation

The range within the Jornada is in excellent winter condition. The quality of the winter forage is high and it occurs in sufficient quantity to supply the needs of the Jornada herd. Although there is

an excellent chance for a good crop of winter and spring weeds the stocking of the Reserve is such that in case this promise of additional forage fails to materialize there will be no losses incidental to lack of feed.

The precipitation for the month is a little more than a trace. However, due to the absence of high winds the soil moisture conditions are excellent for this time of the year.

Condition of Stock

All stock are in excellent condition. The cows and calves recently purchased are showing their appreciation for the Jornada supply of forage by making rapid gains in weight and appearance.

No death losses have been reported this month. The Jornada record for low death loss this year is a very striking one when it is compared with reported losses on outside ranges. One of the prominent stockmen of Southern New Mexico reported recently a loss of about 20 head of cows in one small area. To date the Jornada loss is two head of cows. Another stockman of this vicinity reports the loss of 50 calves from "excessive heat" during the summer. The Jornada figures again show the loss of two calves, one that was probably injured during branding and one that was found mired down in a surface tank.

Investigative Work

The work this month consisted of the preparation of the annual report and the compilation of data. Ranger H. Garvin Smith is working up the data from the recent range reconnaissance.

Personnel

Mr. Campbell and Mr. Merrick left the Jornada on the 16th of the month. Campbell attended the meeting of the A. A. A. S. in New York City and then returned to his post-graduate work at the University of Chicago. Merrick will also resume his work at that institution. Ranger H. Garvin Smith of the Datil N. F. is helping out on the Jornada during a two-month detail.

Canfield and Smith attended a meeting of the New Mexico State Fish and Game Commission at Santa Fe December 17 and 18.

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